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Vitality of Seed Corn

Agriculture
B. S.
1904

VITALITY OF SEED CORN

UNDER VARIOUS CONDITIONS OF ENVIRONMENT

BY

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THESIS FOR THE DEGREE OF BACHELOR OF SCIENCE

IN THE

COLLEGE OF AGRICULTURE

OF THE

UNIVERSITY OF ILLINOIS

1904

UNIVERSITY OF ILLINOIS

May 30, 1904

THIS IS TO CERTIFY THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

Rollo G. Riddle

ENTITLED "Vitality of Seed Corn"

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE

OF Bachelor of Science in Agriculture

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METHODS OF STORAGE

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At the present day there are numerous methods in vogue for storing seed corn. In fact there are probably a larger number in practice now-days than formerly. The farmers who are progressive are beginning to realize the value of carefully storing their seed corn, so consequently they are using different and better methods than formerly. In earlier days there was no corn breeding in practice, neither was there much care given to saving seed. It was either left on the stalk in the field, in the shock, or else it was husked and thrown in some open crib or barn. No attention was paid to using artificial heat or in trying to dry it out, nor were there any proper tests made of its vitality. Agriculture in this line has advanced equally with other branches of industry. Thus today we see farmers with their seed houses having artificial heat while others are equipped with tight cribs and methods of ventilation.

The following are some of the methods of storing seed corn which are now in practice amongst our Illinois Farmers.

First - Tight store-rooms or houses with artificial heat.

Second - Tight store-houses equipped with ventilators and having no artificial heat.

Third - Tight rooms or houses without artificial heat or special ventilation.

Fourth - Cribs of various kinds such as rail pens, and the common corn crib.

Fifth - Corn hung by the husk, stored in top of barn, crib or house.

Sixth - Corn left in shocks all winter, and lastly, corn left standing in field on the stalk during the winter.

Many careful farmers who save only their own seed practice the fifth method, but the up-to-date seed growers practice either of the first two mentioned methods. Some use the tight store rooms with their methods of heating while others depend wholly upon ventilation. The people having the artificial heat as a rule have very little ventilation and some have none of it at all.

The general method of adding artificial heat is the stove which is usually placed in the middle of the room. Enough fire is kept in the stove to keep corn drying all the time and then again to keep it from reaching the freezing point. The temperature is never allowed to reach the freezing stage during the drying process.

One seed corn grower, Mr. W.M.Green of Lockport, Ill. even used lamps under the floor during the coldest weather to keep the lower layer of corn from being injured. In addition to the stove method for adding heat there is the furnace heating method. This is very little used as yet. The Funk Bros. of Bloomington and B.F. Wyman of Sycamore are the only ones to my knowledge in this state who use this means for drying their corn.

Others are contemplating the building of furnaces in their seed houses this summer for use during next winter. In the seed houses of the Funk Bros. the heat comes from the furnace up through the floor and then ascends and finally goes out through the ventilators. Furnaces are better than stoves,for the heat can be more uniform and then again it can be made to dry corn out better next to the floor. If more ventilation was used in connection with the stoves it is probable that the corn would dry out sooner.

The progressive seed corn raisers who do not have any artificial heat in their seed houses depend entirely upon the circulation of air through their houses to dry the corn. Mr.E.E. Chester of Champaign has had one of these seed rooms for some time. When weather is not wet and inclement he opens all his doors and windows on three sides of his room and allows air to circulate freely. This kind of a storage room does away with the trouble and expense connected with a stove or furnace, averts the danger from fire, and at the same time seems to give as good satisfaction as the heating method. The idea is to drive most of the moisture out of the corn before the coldest weather arrives, for cold does not seem to affect the vitality of corn after the excess of moisture has been evaporated from the ear.

There are other kinds of store rooms without either the heat or ventilation. They are simply tight rooms of some kind which are either connected with the residence or an out-door house such as wood-shed or tool house. This kind of storage

is inferior to the former two methods as it requires corn to dry out slower, thus giving it more of a chance to become damaged in vitality by the cold weather. Of course there is some ventilation in some of these rooms but not a sufficient amount. In well-ventilated rooms as a general thing the largest part of moisture is out of the corn by the time the freezing weather comes. If corn was therefore very moist when first placed in these tight rooms without ventilation and heat it looks probable that its germinative power would be lessened when the atmosphere in the room fell to freezing point.

In addition to the various kinds of seed houses and storage rooms used by the progressive seed growers and farmers there are the various kinds of cribs used by the average farmer. The classes of cribs vary all the way from the tight bin in the barn to the rail pen in the edge of the field. The corn for feed and seed is husked and usually thrown into these various cribs in one large pile. No attention is given to ventilation or condition of corn. Occasionally some farmers pick out their seed while they are scooping it into the crib and place it in the loft of the barn or above the driveway in the crib. Others will throw it into a box or barrel in the crib by the side of the other corn.

The most careful of the average farmers store their corn in a substantial rather tight crib or bin in the barn while the careless ones will erect rail pens in the edge of the fields and then after the corn is thrown in will probably neglect to roof over the corn. The shiftless farmer or the one who is

cares only to get his corn husked before winter sets in and thus pays little attention to condition of crib. When spring comes and he hauls the corn off to the mill he may throw out to one side an occasional good ear for seed. Some farmers who use the rail pens sometimes use tile in them for ventilation if the corn is not sufficiently dried out when husked, and again they will sometimes even go to the trouble of making a rather tight crib. But then any kind of rail pen is not very good even with the roof on as it allows corn on the outer edge to absorb moisture almost as fast as it is driven out.

The tight cribs are better than rail pens to keep corn in good condition but may not be as good in allowing corn to dry out.

If corn is very moist when it is scooped into these tight cribs or bins and very little ventilation is accessible it may cause the corn in the middle of a large pile to mould or rot. Tight cribs keep the corn perfectly from the weather, but they should have means of ventilation in order to dry the corn and thus to keep it from spoiling. The double corn crib with the drive way in the middle ought to be about the best kind of crib as it allows ventilation on two sides and at the same time protects corn from the weather. If the spaces in the siding were 1/4 inch in width it would thus allow corn to dry out sooner and at the same time not allow it to be damaged much if any by the changes of weather.

In selecting corn for seed some farmers go to the trouble of picking their corn with husks on. They go into the field

early in the fall and pick out the best seed ears. These ears they hang up either in the barn, top of corn crib or loft of house to dry out. The idea is to hang the ear up by the ends of the husk and thus allow the ear to have access to surrounding air. Corn dries out very fast in this way but I doubt if it would pay to do this if much seed were saved. This practice is usually practiced by the small farmer who only saves a few bushels. It requires a good deal of space to hang a small amount of corn up by the husks and then again it takes a good deal of extra time to pick it with shucks on and later to tie it up by the husks. This method is a good one expecially if the corn is tied up in the kitchen attic where it may have access to some heat. Whether this practice pays for itself has never been proven but it seems as if it would be rather practical for the farmers who only save small amounts of seed corn.

The shiftless class of farmers use sometimes one of the following methods in selecting their seed corn: either leaving the corn in the shock all winter or allowing it to stay on stalks during winter. But as a general rule the above kind of farmers are becoming fewer in number every day. Farmers often cut their corn and shock it early in the fall. During the latter part of the winter and early part of spring they occasionally throw to one side some of the best ears for seed while they are feeding it. This is a very poor practice to follow as corn is usually shocked before maturity and thus it is not allowed to dry out before freezing weather comes. In a number of cases if the shock is too large and corn rather green it will mould and rot in the shock. Of all the methods of storing seed corn

this seems to be the poorest and most shiftless for vitality is usually low in shock corn.

The other method of leaving corn on the stalks in the field during the entire winter was practiced quite frequently by our forefathers. They thought that it gave corn a better chance to mature and to dry out than if it was stored. If corn is matured before cold weather comes on and if stalks keep standing without falling over and the husks stay in place, then such corn might be but very little damaged. But then if corn is immature at the time frost or cold weather begins this would be a poor method. Again the stalks are likely to be blown down and the husks so disarranged that the corn would be damaged by the weather. When cold weather comes as it did last year before corn was all mature then it would be better to have corn stored in a store room or tight crib than left out in the field.

Some farmers shell their corn early in the winter or late in the fall after it has dried out considerably. This method economises space and storage facilities. At the same time it is a great risk, for corn may not be dry enough to keep very well in shelled condition. It is a good practice to shell it in the latter part of the winter or early in the spring, sometime before planting. I have seen several lots of corn on the cob which were still rather moist this spring. This same corn would have dried out less if it had been shelled. It is better to leave corn on the cob and allow it to dry out thoroughly than to shell it before it is dry enough.

Another point in the storage of corn to be considered is

that of protection from mice and rats. Farmers or seedsmen who go to the trouble of building a seed house with the necessary equipments generally make them mouse proof. But the average farmer who keeps his seed corn in the crib, barn or store room pays very little attention to the mouse or rat problem. They generally trust in the fact that probably the mice wont spoil all their seed or else that the barn or house cat will make short work of the rat or mouse who makes his appearance in the place where the seed is stored. Some conscientious farmers who have no seed houses occasionally keep their seed corn in a suspended box or shelf in the barn or corn crib. Here at the University in the large storehouse they have a large shelf suspended from the ceiling in one of the rooms for the purpose of protecting their various kinds of seeds from the rats and mice. This problem is quite as important as those of heat and ventilation.

G E R M I N A T I O N T E S T S

In making the tests of germination of corn for finding its per cent of vitality I have constantly kept in mind two main points: First, that the kernels taken from various ears in the sample should represent those ears in general; Second, that the testing for all the samples should be uniform in every respect.

In taking the samples of corn I have taken one hundred ears as a basis for my tests, and from these one hundred ears I have taken three kernels each, from every ear. Much care need be taken in selecting the three kernels. The tip and but grains should not be taken from the extreme ends, while the kernel from the middle should come from any place near the middle of the ear. In taking the grain from the butt I usually extract it about one inch from the extreme edge of the butt. Next I turn the ear one third the way round in my hand and choose one kernel from the middle part of the ear. Lastly I turn the ear another one third the way around in the same direction as before and take a kernel from the tip portion about two inches from the extreme tip. Of course the quality of corn on both ends determines how near the extreme limits the sample kernels should be taken.

The idea in turnish the ear one third the way round after each sample grain is taken is to avoid getting all three grains from the same row or adjacent rows. As it is, these three grains from different parts and sides of the ear represent as nearly

as possible the best average sample to be obtained from the ear.

In taking the kernels from the ears I have used a pair of medium sized tweezers. A knife is just as good and is used by many. Anything may be used which does not injure the grain in pulling it from its hold to the cob. Oftentimes if care is not taken the germ will be injured or the extreme tip of the grain may be left on the cob together with part of the scutellum surrounding one end of the germ.

In selecting the hundred ears from each lot of corn I have aimed to choose good seed ears which would well represent the best grade of corn in the sample. Bad ears of any description and small nubbins have been discarded in every case except where most all of the sample consisted of this kind of corn.

My representative grains from each ear have been taken from those parts of the ear used for seed. I have avoided in all cases the taking of samples from the extreme butt or especially from the extreme tip. The kernels on the tip are always of an inferior nature and it is the common custom to shell from one to three inches of grain off of this end in saving seed.

In all the samples that I have taken personally I have used one hundred ears as a basis with three grains from each ear. Of course the larger the number of ears represented the better will the result stand for the average vitality of the corn. In some cases I have used complete samples of more than one hundred ear lots. The kernels have always been carefully selected in order to represent as nearly as possible the average of the ear.

The next step after the kernels have been carefully select-

ed is that of germination. In all my tests I have tried to have uniform conditions. The most important to consider in testing for vitality are those of moisture, heat and ventilation.

My tests have all been made in sand in common porcelain dinner plates. The sand was usually sifted (although this practice is not absolutely necessary) and poured into plates in a dry state. In moistening the sand great care was taken not to get it too wet. Too much moisture will cause grains to mould and rot before they have a chance to germinate. I never saturated my plate of sand in the manner suggested by Bulletin 63 of Illinois Experiment Station because it takes some time to pour off the extra amount of water needed. Instead I sprinkled the water on dry sand with small sprinkler until it was fairly well moistened but not so moist that water could be squeezed out of it.

After the sand in the plates was uniformly moistened I leveled it downsomewhat and then counted out one hundred kernels on its surface. These kernels I pressed into the sand just far enough for them to absorb moisture but not out of sight.

From several experiments I found that kernels planted tip down or those planted completely under the sand gave no better results than those planted on side with germ side either up or down and with their surfaces exposed. A plate was used as a cover for the grains. The cover should not fit too tightly as ventilation is one of the main requisites. Free access of air is necessary in order to allow the obnoxious gases such as CO_2 to escape. (Reference M.S. Year Book, 1895) The cover plate should be tight enough to exclude most of the light but not tight enough

to exclude air. Corn seems to germinate better in darkness than when exposed to too much light.

The temperature of the germinating room is another feature in the testing. The range of temperature used was between 80 and 100 degrees. Below or above these limits produced poor results. Other grass seeds will sprout under lower temperatures but maize does not do well if the temperature is not at least 80 degrees. 90 to 100 degrees seems to be the best heat as they sprout very quickly at this temperature if the vitality of corn is good.

Good corn usually germinates from 85 to 90% after being in germinating room for two days. At the end of two days I would remove all those grains which have sprouted 1/4 of an inch or more in length. I always left the grains in the sand until either the root or plumule showed vigorous growth. Oftentimes the node between the root and plumule would swell considerably while either the root or stalks would start to grow. Invariably I could count these grains as they would rot after h aving started to sprout.

After the plates had stayed two days in the germinating room they would usually be needing moisture after sprouting grains were removed. After the second day I examined plates carefully and kept account of temperature, number of sprouted kernels each day and condition of sand. I found in most all cases except one or two that corn would not sprout after the fourth or fifth day. Some people advise leaving corn to be tested in the germinator for seven days, but I have found all good corn to

germinate in at least four days, while corn of inferior vitality would germinate probably one or two grains on the fifth, but nothing after the fifth day.

In all my tests I have paid special attention to having them uniform in the way of ventilation,heat and moisture content. Every sample was given ideal environment and if poor percents in vitality were shown it was due to the condition of the corn and not to outside conditions.

TABLE I SHOWING VITALITY TESTS.

(a)

Fire Dried with Ventilation.

Freeze Nov.16 Time Husked.	Number of ears	No.of Kernels Per ear	Grains	Per cent Germ.	Variety.
		Composite			
Before	80	140	4	90	Leaming
	Generally mature-bright and solid, Funk Bros.Growers.				
		Composite			
"	84	160	4	92	Yellow Dent.
	Generally mature-bright and solid, Funk Bros.,Growers.				
		Composite			
"	89	163	4	96	Boone County
	Generally mature, bright and solid, Funk Bros.,Growers.				
		Composite			
"	68	204	3	86	Calico Corn
	Generally matured-rather loose on cob, Funk Bros.,Growers.				
		Composite			
"ø	504	300	4	74	Gold Mine
	Apparently mature-rather loose on cob, B.F.Wyman,Grower.				
		Composite			
After #	456	300	4	62	Pride of North
	Apparently mature-color not good, B.F.Wyman, Grower.				
Before	100	300	3	95	Boone County
	Matured, Bright and Rather Moist,J.O.Toland,Grower.				
		Composite			
" & After	529	300	4	85	Silver Mine
	Partially matured,Bright but not solid;Grown on Sibley Est.				
		Composite			
" "	414	200	4	88.5	Riley's Favorite.
	Partially matured, Bright and rather solid, Sibley Est.				
		Composite			
"	109	300	4	87	White
	Matured, Color Good, L.B.Clere, grower.				
"	41	123	3	90	Yellow
	Matured, Bright & Rather Moist, W.M.Green,Grower.				
"		201		98	Yellow
	Matured, Sound and Dry, S.Hoffenden, Grower.				
"		200		94	Bet White & Yellow
	Matured, Sound and Dry; S.Hoffenden, Grower.				
"		143		95	White
	Matured, Sound and Dry; S.Hoffenden, Grower.				

ø - Low vitality of this Gold Mine must have been due to some outside cause as it was husked before freeze and placed in seed house

(over)

with heat and ventilation.

- This corn was shocked when real sappy in Sept. and was left in field until after the freeze. Will leave this test and above Goldmine test out of Table II.

(b)

Fire Dried Without Ventilation

Time Husked	Number of ears	No. of Kernels	Grains Per ear	Per Cent Germ.	Variety.
Before Freeze & After Mature but not dry, Bright and solid; J.R.Clisby, Grower.	451	Composite 300	4	97	Leaming
" Mature but not dry, Bright and Selid; J.R.Clisby, Grower.	298	Composite 300	4	91	Boone County
Before Not all matured, dry and good color; W.H.Sprecker, grower.	100	200	2	97.5	Yellow
" Matured, fine condition; Means Bros., Growers.	50	100	2	100	Yellow

(c)

Corn Stored in Houses with plenty of Ventilation but no heat.

Before Fairly matured, bright and rather solid, E.E.Chester, Grower.	100	300	3	96	Leaming
Before & After Mature - Bright and rather solid; L.Maxey, Grower.	433	Composite 300	4	95	Leaming
" " Mature - Bright and rather solid, L.Maxey, Grower.	50	50	1	90	Leaming

(d)

Tight Cribs and Store Houses

Before ø Mature - bright and sound; Carmichael, Grower.	Several Bu.	Composite 300	Middle of ear	97	Leaming
" Mature - Bright and Sound; Carmichael, Gr ower.	Several Bu.	300	Tips & Butts	96	
" Mature - dry and solid; G.Shaw, Grower.	100	300	3	96	Farmers Int.
" Rather Sappy - dry and solid; G.Shaw, Grower.	100	300	3	98	Leaming
" Mature - bright and firm; J.E.Gaeser, Grower.	100	300	3	95	Leaming

Time Husked	Number of ears	No. of Kernels	Grains per ear	Per cent Germ.	Variety
Before freeze		50		100	Yellow Dent.
	Mature - Fine Condition; E.A.Harroun, Grower.				
"		50		80	W.Fair Corn
	Mature - color only fair; E.A.Harroun, grower.				
"	100	300	3	86	Boone County
	Moist but mature - rather solid; H.S.Riddle, Grower.				
"	76	228	3	94	Yellow
	Mostly mature - bright and sound; U. of I. Grower.				
"	100	300	3	94	Yellow
	Mostly mature - bright and sound, low protein; U.of I.				
"	100	300	3	85	Yellow
	Mostly mature, some mouldy ears, high protein; U.of I.				
#					
"	100	300	3	64	White
	Mostly mature, moist and rather mouldy, low protein, U.of I.				
"	100	300	3	95	White
	Mostly mature, bright and sound, high protein, U.of I.				
After	82	246	3	90	J.C.White
	Mature, Good condition; A.F.Doerr, Grower.				
"	100	300	3	90	Reid Y.Dent
	Mature, Ears and Cob Moist; W.H.Young, Grower.				
Before	100	300	3	93	White
	Mature, Dry and good color; J.Kerns, Grower.				
"	96	96	1	98	Yellow
	Mature, Dry and good color; Owen Acom, Grower.				
"	100	300	3	91	Mixed
	Mature and dry, A.Seymour, Grower.				
After	100	300	3	88	Leaming
	Mature, Rather Solid; G.Hoots, Grower.				
Before	100	300	3	82	Bonne Co.
	Mature - Rather moist; H.S.Riddle, Grower.				

ø - These samples of corn over 95% were all thoroughly dried on shelves in open cribs before cold weather arrived and placed in tight cribs or store rooms before cold weather came.
- The vitality of this sample must have been due to outside causes. It will be omitted in Table II.

(e)

Storage in Different Styles of Open Cribs.

Time Husked	Number of ears	No. of Kernels	Grains per ear	Per cent Germ.	Variety
Before Freeze.	100	300	3	87	Yellow
	Mature, rather moist; C.A.Bishop, Grower.				
"	100	300	3	60	White
	Rather sappy, soft and moist; C.Ashworth, Grower.				
"	100	300	3	64	Leaming
	Fair Condition; Snyder, Grower.				
After "	100	300	3	58	Leaming
	Partially mature, Poor, Snyder, grower.				
Before "	100	300	3	63	Leaming
	Partially mature, fair condition, Snyder, grower.				
	Composite				
After "	276	300	4	72	Beaty's Yellow
	Partially matured, only fair condition; W.H.Beaty, Grower.				
Before "	100	300	3	57	Boone County
	Partially matured, moist and poor color; Goodspeed, Grower.				
	Shelled				
After "	2 bu.	99		92	White
	Partially matured, bright and sound; W.S.Ennis, Grower.				
" "	2 bu.	99		94	White
	Partially matured, Bright and sound; W.S.Ennis, Grower.				
"	2 bu.	105		87	White
	Partially matured, bright and sound; W.S.Ennis, Grower.				
" "	2 bu.	100		61	White
	Partially matured, poor condition; W.S.Ennis, Grower.				
" "	2 bu.	99		79	White
	Partially matured, fair condition; W.S.Ennis, Grower.				
" "	2 bu.	98		93	White
	Partially matured, good and solid; W.S.Ennis, Grower.				
" "	2 bu.	70		95	White
	Partially matured, good and solid; W.S.Ennis, Grower.				
" "	2 bu.	101		95	White
	Partially matured, good and solid; W.S.Ennis, Grower.				
" "	2 bu.	115		90	Yellow
	Partially matured, good color; W.S.Ennis, grower.				
	Several bu.	100		80	White
	Only fair condition; J.A.Everitt.				

Time Husked	Number of ears	No. of Kernels	Grains per ear	Germinated Per cent	Variety
		composite			
Before Freeze	332	300	4	87	R.Y.Dent
	Rather mature, Good condition; J.T.Smith, Grower.				
" "	100	300	3	84	Yellow
	Mature, Good condition; J.W.Eshelman, Grower.				
" "	100	300	3	93	White
	Mature, Good condition; Wm.Checkley, Grower.				
" "	100	300	3	83	White
	Rather Sappy, hard and dry, C.Bishop, grower.				
1902	100	300	3	94	Yellow
	Mature, Good condition, J.W.Eshelman, Grower.				
Before "	80	80	1	95	White
	Mature, solid; L.Wise, Grower.				

The Low Per Cent of some of these samples was due to the fact that the corn was placed in open crib in rather an immature state. The highest per cent was due to the fact that corn was well matured before being placed in open cribs.

(f)

Corn Hung up by the Husks

Before Freeze #	76	238	3	74	Yellow
	Immature, rather soft; Snyder, Grower.				
" "	100	200	2	99-1/2	
	Mature, find condition; J.W.Templeton, grower.				
" "	155	310	2	85	
	Mature, fine condition; J.W.Templeton, Grower.				
1902	100	300	3	88	Yellow
	Mature - good; J.W.Eshelman, grower.				

- The vitality of this sample is much lower than others and hence must have been due to some outside cause. Will omit it in table II.

(g)

Corn Left on Stalk During Winter

In Spring	100	300	3	66	Leaming
	Rather immature - soft; H.S.Riddle Grower.				
" "	100	300	3	28	Yellow
	Sappy, wet and mouldy; Percival, Grower.				

Time husked	Number of ears	No.of Kernels	Grains per ear	Per cent Germinated	Variety
In spring	100	300	3	74	Yellow
	Hard and Bright - U.of I.				
		(h)			
	Corn left in Shock All Winter.				
" "	100	300	3	62	Yellow
	Rather sappy, damp; G.Hoots, Grower.				
" "	100	300	3	54	White
	Sappy, moist and mouldy; C.Bishop, Grower.				
" "	100	300	3	36	White
	Sappy, moist and mouldy; Haynes, grower.				
		(i)			
	Corn Left exposed to weather all Winter				
On shed top	100	300	3	3	Boone County
	Mature, mostly rotten, H.S.Riddle, Grower.				
" " "	100	300	3	1	
	Immature,practically all rotten, H.S.Riddle,Grower.				
Open Box	100	300	3	6	Leaming
	Mature,mostly spoiled; H.S.Riddle,Grower.				

TABLE II.

AVERAGE OF TESTS OF CORN STORED BY DIFFERENT METHODS

KIND OF STORAGE	NO. OF TESTS	AVERAGE % OF VITALITY
Fire Dried without Ventilation	4	94
Ventilation without Heat	3	93.75
Tight Cribs and Store Houses Without Heat	18	92
Fire Dried with Ventilation	12	91
Hung by Husks	3	90.66
Open Cribs	23	81
Left in Field on Stalks All winter	3	56
Left in Field in Shocks all winter	3	51
Husked and exposed to Weather All Winter	3	5

C O N C L U S I O N S

I. The last four methods according to Table II should not be practiced by anyone saving seed corn.

II. If corn is well matured and thoroughly dry it does not seem necessary to have artificial heat.

III. Tightly built seed houses with artificial heat gave slightly better results this season than seed houses without artificial heat.

IV. From an economic standpoint it does not seem practical to go to the expense of adding artificial heat.

V. Final result of all tests would indicate that all points considered the most practical method of curing seed corn is the well-ventilated seed house without artificial heat.

B I B L I O G R A P H Y

Saving Seed Corn

"The season for ripening is short often resulting in the selection of slightly immature seed. Cold weather coming on does not admit of rapid drying and if cob and grains are not perfectly dry when freezing weather occurs the moist kernels are injured by frost. Corn to be saved for seed should be harvested early and then thoroughly dried as rapidly as possible. When ears can be hung up by the husks and spread out on a dry place on shelves or on a floor and laid only one ear deep it will dry nicely. Drying in a room with artificial heat is the ideal way to prepare seed corn for preserving through the winter. When thoroughly dry the corn may be piled up a foot or less deep on some dry floor or put in bags and stored in a dry place until spring. Seed corn thoroughly dried as by artificial heat will not absorb moisture from the air but will remain dry until planted.

If seed is to be saved out of the bulk of corn it should be picked out before being thrown into the crib unless indeed very dry as corn in bulk often becomes heated which weakens or kills the germ. Disaster often follows piling up large amount of corn from which seed is to be saved. Seed corn should never be stored above bins of grain or over rooms occupied by live stock. The moisture and possibly the gases coming from the stock weakens and destroys the vitality of the seed. The seed will probably stand a better chance

of being preserved if left on the ear until near corn planting time. The great principle in saving seed corn is to dry all H_2Oout of it until it is dry and hard and it will not again easily absorb moisture from the air."

Minn.Exp.Sta.Bulletin 46,pp 339-341.

Storage of Seeds

"After seeds have been heated and are thoroughly dried out they are ready to be stored until required for use. The best way to keep seeds in small lots is in cloth bags, which can be hung up in a dry cool airy place where they can be protected from vermin. Keeping seeds in bottles, jugs, or light cans is a very poor way as it prevents the excape of moisture. Seeds in large lots can be stored in sacks, boxes, barrels or bins and should be occasionally examined."

New Mexico Bulletin 20.

Some Conclusions Derived in Storing Seed Corn

I. "That it is not advisable to harvest immature seed corn, and place in a warm room, as there is danger that the corn will germinate as a result of the moisture and warmth.

II. That corn intended for seed should be allowed to thoroughly mature on the stalk before husking.

III. That the best results are obtained when stored in a dry and thoroughly ventilated place.

IV. That cold does not injure the vitality of seed when it is thoroughly dried and kept dry, but on the other hand, if

allowed to gather moisture, freezing will reduce the vitality and may destroy it entirely.

V. That it is unwise to store seed corn in barrels or boxes, as it will gather moisture, even though it appears to be thoroughly dry. This is especially true during the fall and winter months.

VI. Ventilation is the most important thing in storing seed corn."

Iowa Bulletin 77, pp 180-181.

Government Report on Seed Corn

"After having been properly grown andselected, seed corn may be greatly reduced in vitality by injudicious care during the winter. Any means that secures a thorough drying of the seed ears soon after they ripen before freezing time and keeps them dry until the seed is planted will be a success. It must be remembered that although seed corn is thoroughly dried it will not remain so exposed to a saturated atmosphere. The kernels absorb moisture and if exposed to changes in temperature while moist their vitality will be injured. A thorough drying of seed ears by artificial heat if necessary and their preservation in a dry atmosphere and at a steady temperature is strongly recommended. During past years seed dried by fire and kept dry and at a steady temperature during the winter was planted in comparison with seed from the same fields which was suspended in barns at husking time and left exposed

to atmospheric conditions of temperature and moisture.

The tests were made on different soils and in different states by planting 10 acre plots so that well preserved or fire dried seed was planted in alternate rows with the air dried seed. There was no perceptible difference in the rapidity of germination, 70.9% of air dried and 73.1% of fire dried seed grew and survived. The crop for each row was weighed separately and in all cases each fire dried row produced more and better corn than the air dried rows on either side of it. The greatest differences were on good soil in the Potomac River Bottoms where the fire dried seed produced 18-1/4 bushels more corn per acre. Although all rows were planted by hand with 3 kernels in each hill and germinated almost equally well as above shown at harvest time the fire dried rows contained 12.5% more stalks than the air dried rows. Total increase per stalk was .054 lbs. per stalk in favor of fire dried. On upland clay soil there was an increase of 7 bus. in favor of seed that had had special care given it during the winter.

While it may not be practicable for all growers to keep their seed corn dry throughout the winter by means of fire it is possible for all to dry seed ears thoroughly."

U.S. Yearbook 1902, pp 550-551.

Effect of Liquid Air

Kernels of maize kept in liquid air cracked badly showing that endosperm could not withstand the stress imposed. Seed remained 24-28 hours in one case and 6-8 hours in another. Wheat, rye, flax, castor beans, cucumber and others were not

affected."

Bulletin Torrey Bot 28 No.12.

When to Gather Seed Corn

"If corn is gathered before it is fully matured it is difficult to preserve. When dried in a warm place it is likely to sprout and unless there is a good circulation of air it will become heated and mouldy. Corn left on the stalk has the advantage of a free circulation of air and at the same time the husks protect it from the sun and rain. This allows it to absorb all the nourishment the stalk has for it and at the same time allows it to cure under natural conditions. For these reasons field cured corn presents a brighter and more healthy appearance than that dried by artificial means."

Iowa Bulletin 77 p 170.

Storing Seed Corn

Much importance should be attached to the storing of seed corn. There are many methods in use but experiments indicate that the best results are obtained when the corn is stored in a dry thoroughly ventilated place.

The most critical time in the handling of seed corn is the first month after it has been husked. It is unwise to store it in barrels,boxes or over large quantities of other grains as it will gather moisture. This is not surprising when we remember that one third of the weight of corn at the time of husking is made up of H_2O. This water is contained within the cells of the grain and consequently it is very much harder to dry out

than if it were on the outside. While the grain may appear perfectly dry when stored, as soon as this moisture begins to ooze out the corn will become wet - "gathered moisture" we say - if there is not a good circulation to carry off this exuded water. This makes it unsafe to place corn intended for seed on the floor or on the shelf as the lack of free circulation of air will often cause the corn on the under side of the ear to become mouldy. It is a good practice to place corn on a rack. The strips on which it is placed should be as narrow as practicable to allow admission of air from below. In case a corn rack is not used it is a good practice to hang corn up intended for seed or to place it upon some boards over the corn in the crib where there will be a free circulation of air until such time as there is danger from severe freezing. If it is then not completely dry it should be dried artificially or placed in a ventilated room where there will be no danger from freezing. If corn is placed in a warm room while it still contains a large amount of moisture it is almost certain to either mould or grow. For this reason corn should be dried in a cool airy place. When it once becomes thoroughly dry and is kept dry, cold will not injure it, but on the other hand if allowed to gather moisture freezing will reduce the vitality and may destroy it entirely."

Iowa Bulletin 77, pp 170-171.